ARJUNA

JEE

LECTURE NO. - 2

Basic Maths

MSM SIR

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KAHAANI AB TAK

closed and open bracket

$x \in [2, 7)$

$x = 2$

$x \neq 7$

Continous values (Interval involved hai)

Discrete values

$x \in \{2, 3\}$

(No interval)

$x = 2, 3$

"only 2 points"

$x \in (2, 3]$

↳ all are wrong

$x \in [2, 3]$

$x \in \{2, 7)$

Example

$$x \in (2,3) \cup (3,7) \cup (7,10)$$

Can also be written as:

$$x \in (2,10) - \{3\} - \{7\}$$ ✗

OR

$$x \in (2,10) - \{3,7\}$$ ✓

Q. Write Correct number line representation for: $x \in [-10, 9) \cup (9, 11]$

$x \in [-10, 11] - \{9\}$

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WAVY CURVE METHOD

→ other teacher's method may be distinct.

★ Msm Method →

1. → Make sure that one side of the inequality is ZERO.
2. → Make sure that the Leading coefficient is Positive.
   (Leading coefficient = Coeff. of highest Degree term)
3. → Factorize into linear factors.
4. → make number line and plot points (open and close ek sath)
5. → D.L.A.P.
6. → Enjoy

Q → Find the leading coefficient in

$$-2x^6 + 7x^5 - 2x^4 + x + 2x^2 + 9x^9.$$

Ans = 9

POLYNOMIAL INEQUALITIES

(i) $(x-1)(x-2) > 0$ → Solve for 'x'

↳ "Wo 'x' find Kariye, Jiske liye "$(x-1)(x-2)$" positive ho."

→ Kuch bhi ho sakta hai.

→ 'P' or 'N' or 'Z'

ex → $x = -2$ ✓

$(-2-1)(-2-2)$

$= (-3)(-4) = 12 > 0$

$x = -3$

$(-3-1)(-3-2) = 20 > 0$ ✓

$x = 1$ ✗

$(1-1)(1-2) = 0 > 0$

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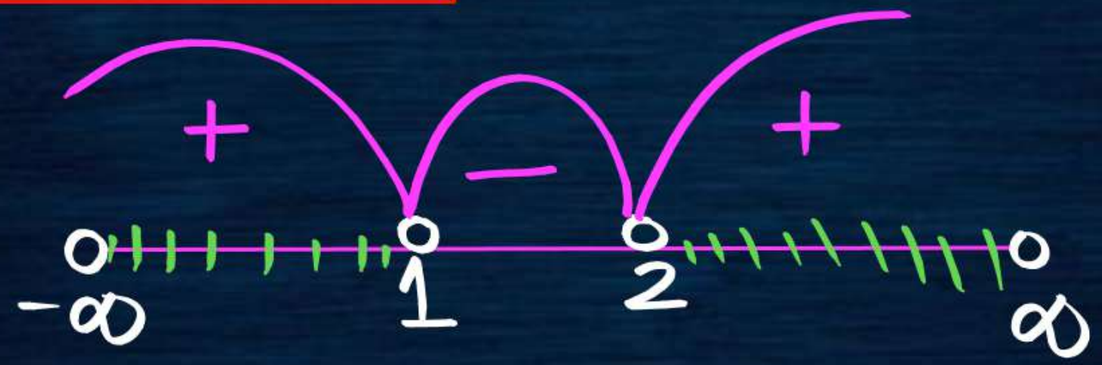
POLYNOMIAL INEQUALITIES

step 1 ✓
step 2 ✓
step 3 ✓

(i) $(x-1)(x-2) > 0$



$x \in (-\infty, 1) \cup (2, \infty)$ Ans

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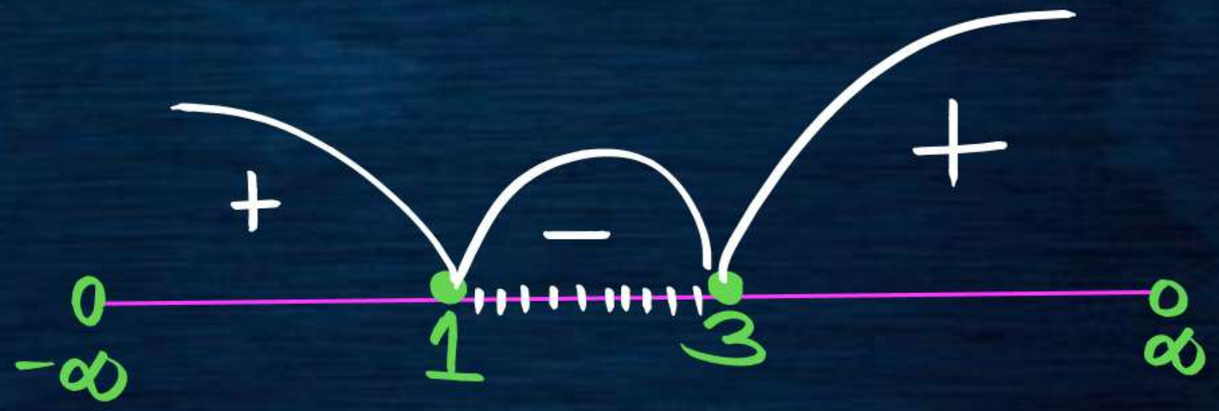
(ii) $(x-1)(x-3) \leq 0$

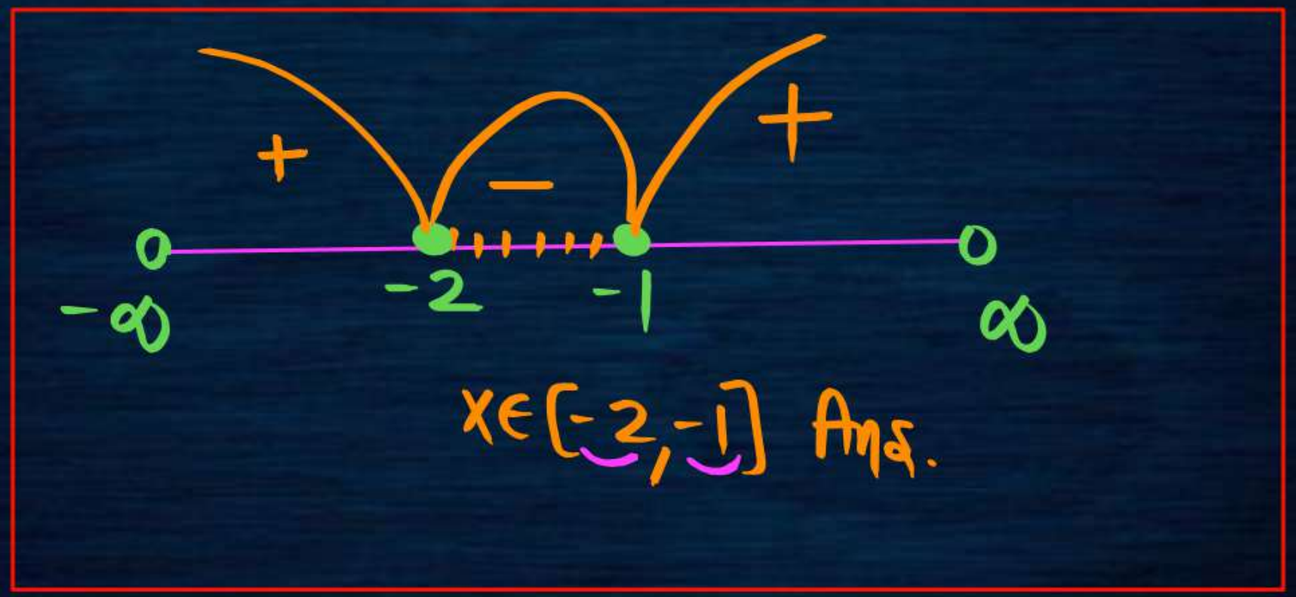
Solve for 'x':



$x \in [1,3]$ Ans.

Q. Solve for x : $x^2 + 3x + 2 \leq 0$

$(x+1)(x+2) \leq 0$



$x \in [-2, -1]$ Ans.

Q. Solve for x : $x^2 + x - 1 \leq 0$

$$x^2+x-1 \leq 0$$

$$\left(x-\left(\frac{-1-\sqrt{5}}{2}\right)\right)\left(x-\left(\frac{-1+\sqrt{5}}{2}\right)\right) \leq 0$$

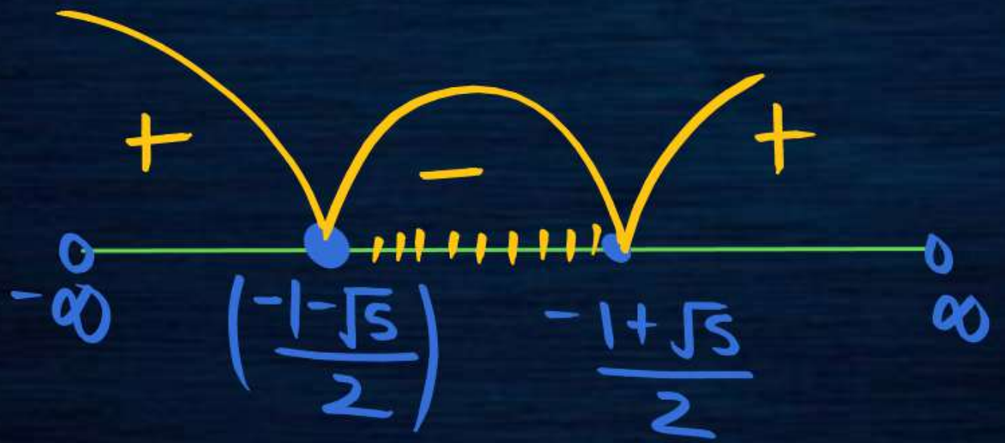
x^2+x-1

Roots

$$x = \frac{-1 \pm \sqrt{5}}{2}$$

$$\left(\frac{-1-\sqrt{5}}{2}\right), \left(\frac{-1+\sqrt{5}}{2}\right)$$

$$x^2+x-1 = \left(x-\left(\frac{-1-\sqrt{5}}{2}\right)\right)\left(x-\left(\frac{-1+\sqrt{5}}{2}\right)\right)$$



$$x \in \left[\frac{-1-\sqrt{5}}{2}, \frac{-1+\sqrt{5}}{2}\right] \text{ Ans}$$

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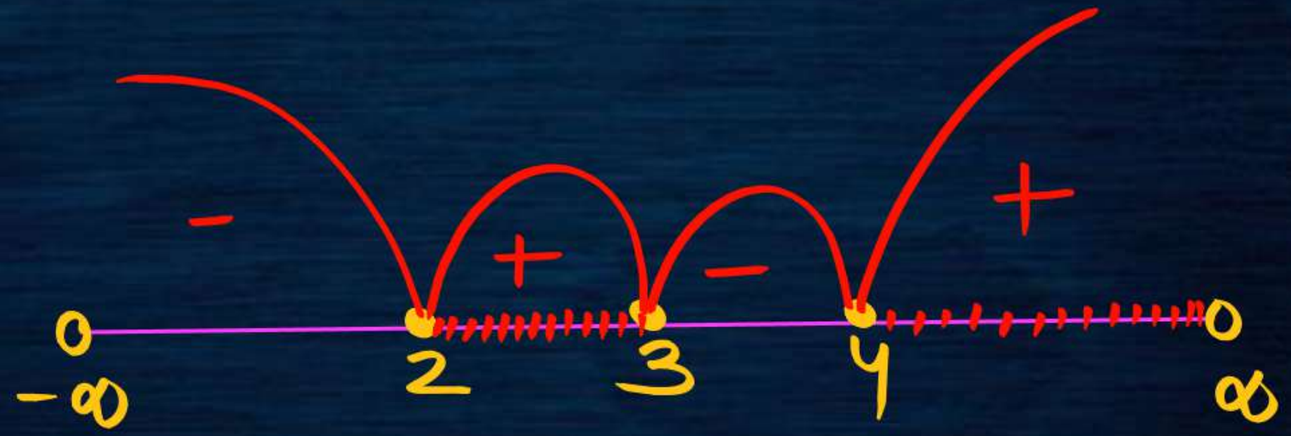
Concept →

Roots $\rightarrow \alpha, \beta$

linear factors

$$(x-\alpha)(x-\beta)$$

Q. $(x-2)(x-3)(x-4) \geq 0$ "Solve for x" ?



$x \in [2,3] \cup [4,\infty)$ Ans.

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Q. $(-x-2)(x-3)(x-4) \geq 0$. "SOLVE FOR X"

$\times(-1)$ ↓

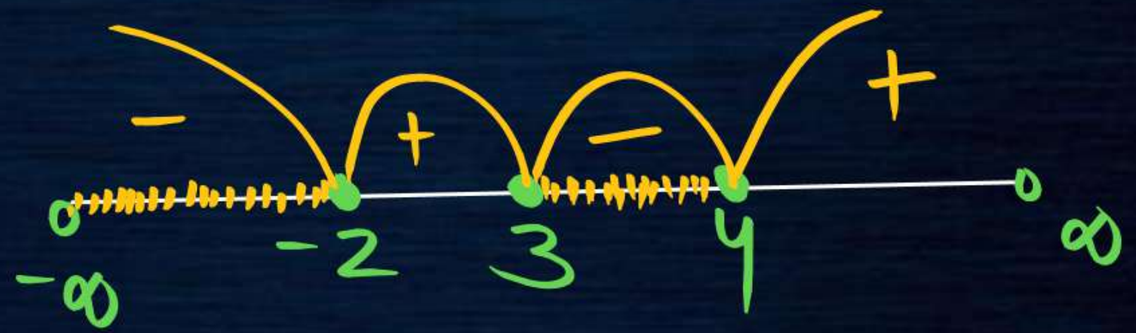
Step 1 ✓

step 2 ✗ ⇒ Leading coeff. negative ✓

(minus se multiply Both the sides)

$$-(-x-2)(x-3)(x-4) \leq 0$$ ✓

$$\boxed{(x+2)(x-3)(x-4) \leq 0}$$



$x \in (-\infty, -2] \cup [3,4]$

Ans

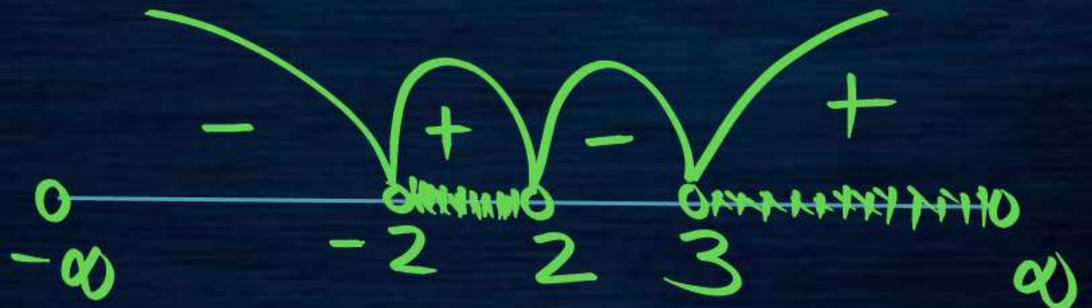
Q → Solve for x →

$$(x-2)(x+2)(-x+3)<0$$

$$\left|-(x-2)(x+2)(-x+3)\right|>0$$

Step 1 ✓
Step 2 X

Final ans → $(x-2)(x+2)(x-3)>0$



$x \in (-2,2) \cup (3,\infty)$ Ans.

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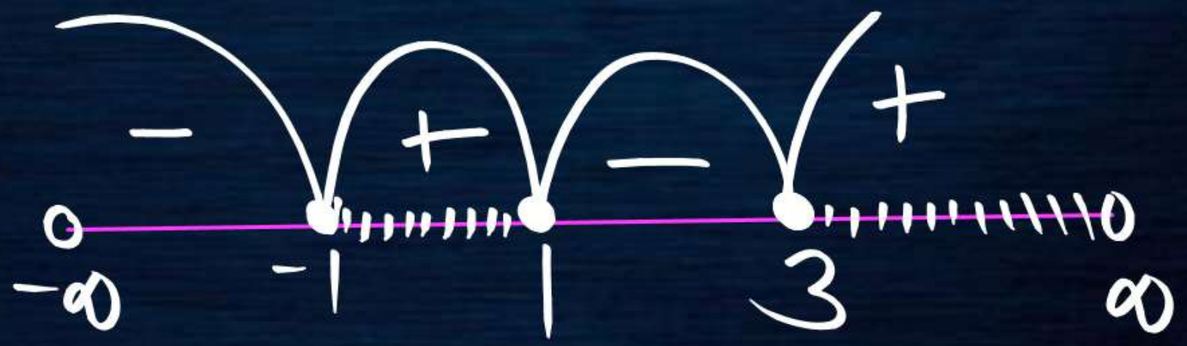
Q. $x^3 - 3x^2 - x + 3 \geq 0$. "SOLVE FOR X."

$x^2(x-3) - 1(x-3) \geq 0$

$(x^2-1)(x-3) \geq 0$

$\boxed{(x-1)(x+1)(x-3) \geq 0}$



$x \in [-1,1] \cup [3,\infty)$ Ans

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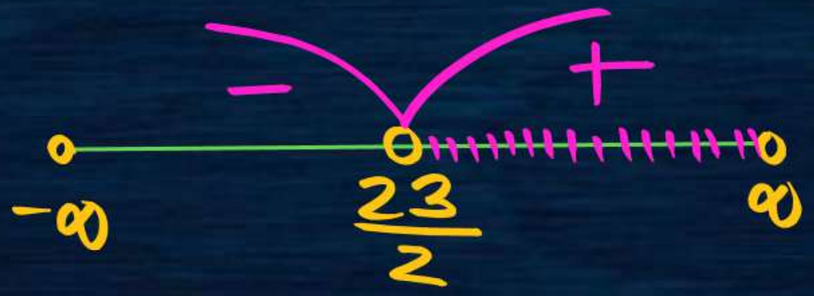
Q. Solve the linear inequality $5x - 7 > 3x + 16$

$5x - 7 - 3x - 16 > 0$

$(2x - 23) > 0$



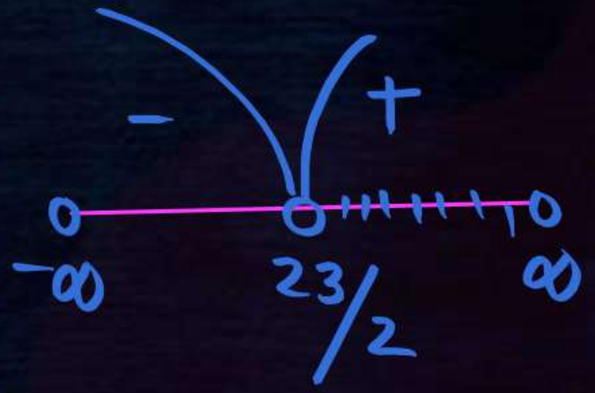
$x \in \left(\frac{23}{2}, \infty\right)$

OR

$0 > 3x + 16 - 5x + 7$

$x(-1)$ $0 > (-2x + 23)$

$0 < (2x - 23)$



$x \in \left(\frac{23}{2}, \infty\right)$ Ans

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Q. Solve the linear inequality $1 - \frac{3x}{2} \leq x - 4$

(HW Q)

?

Q. Solve the linear inequality $ax \leq 1$

(OP/Challenge Sawaal) ?

"OP Done"

NOTE

1. Denominator can never be zero .

For Example : In $\frac{1}{x-1}$, $x \neq 1$.

$x - 1 \neq 0$

$x \neq 1$.

maths K Sanskaar.

$\frac{1}{0}$ = Not Defined

$\frac{1}{0} = \infty$ ↳ WRONG

$\left(\frac{x}{x-2}\right)$; $x-2 \neq 0$

$x \neq 2$

$\frac{x^2}{(x-1)(x-2)}$; $(x-1)(x-2) \neq 0$

$(x-1) \neq 0$
$(x-2) \neq 0$
$\Big\}$ $x \neq 1, 2$

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Q. Consider the equation $x^2 - x - \frac{1}{x-1} = 1 - \frac{x}{x-1}$ then x equals -

JBK (option) ?

Challenge

1. $\pi - \frac{22}{7}$
2. $\pi - 3.14$
3. $\cos 90°$
4. $\cos 0°$

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Doubt →
DPP 1 (Q9)

Homework

DPP 1 → Q10, 11

α, β → lie on opp sides of '0'

- α → Posi, β → Neg
  $\alpha\beta$ = Negative $\Rightarrow \alpha\beta < 0$ } $\alpha > \beta$
- α → Negative, β → Positive
  $\alpha\beta < 0$ } $\alpha < \beta$

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Thank – You

- *FUTURE IIT-IANS*